Claims

[c1] 1. A method of optical part shape measurement of a bare metal part to determine acceptability of the part, comprising:
illuminating the surface of the part with a variable level light source;
measuring light level values over the illuminated part and comparing data represented by the light level values with a reflectivity model of the part;
determining whether or not to accept light level values for various regions on the part's surface and discarding the data for a region if a sufficiently high confidence level with respect to the data for that region cannot be reached;
masking each region on the part for which data is discarded; and,
changing the intensity of the light level with which the part is illuminated and acquiring new data for each masked region, the new data now being compared with the reflectivity model of the part and if a sufficiently high confidence level with respect to the new data can now be reached, replacing the discarded data for that area with the newly acquired data whereby acceptance of the part is based upon acceptable data for the entire part.

[c2] 2. The method of claim 1 in which the part is mounted on positioning equipment by which the part to be moved from one position to another position, and the method further includes repositioning the part, as well as changing the intensity of the light level to obtain acceptable data for masked regions of the part.

[c3] 3. The method of claim 2 further including initially varying orientation of the part and adjusting the intensity of the light level to obtain acceptable data for substantially most of the part.

[c4] 4. The method of claim 1 further including determining the acceptability of the part only after acceptable data is obtained for the entire surface of the part.

[c5] 5. The method of claim 1 in which the part is illuminated with a laser stripe projector (VLS) and viewed with a plurality of cameras.

[c6] 6. The method of claim 3 in which initially varying orientation of the part and adjusting the intensity of the light level includes locating the part position and

light intensity level which produces the smallest range in variation of the data over the surface of the part.

[c7] 7. A method for measuring the surface of an uncoated metal part having a complex part shape comprising:

mounting the part on a movable support;

illuminating the part with a light having a variable intensity and capturing images of the part when moved to different positions and illuminated with different levels of light;

processing the images to obtain data representing a pixel value for each location on the part's surface;

comparing the processed images with a reflectivity map of the part to determine which part position and which light intensity level provides sufficient data on which acceptability of the part can be determined;

identifying those regions on the part in which light reflected from the part is so diffuse or so specular that data obtained for those regions cannot be used in part acceptability determination;

masking those regions of the part for which the data cannot be used;

varying both the position of the part and the light intensity level to obtain new data for those regions which is acceptable; and,

replacing the data for those regions which cannot be used with the acceptable data whereby the acceptability of the part can now be determined.

[c8] 8. The method of claim 7 in which initially moving the part to different positions and varying the intensity of the light level includes locating the part position and light intensity level which produces the smallest range in variation of the data over the surface of the part.

[c9] 9. The method of claim 8 in which the part is illuminated with a laser stripe projector and viewed with a plurality of cameras.

[c10] 10. Apparatus for measuring the surface of an uncoated metal part having a complex part shape comprising:

a base on which the part is mounted and means for moving the part from one position to another;

a variable intensity light source illuminating the part;
at least one camera capturing images of the part in its different positions and when illuminated with different levels of light; and,
a processor processing the images to obtain data representing a pixel value for each location on the part's surface, the processor comparing processed images with a reflectivity map of the part to determine which part position and which light intensity level provides sufficient data on which acceptability of the part can be determined.

[c11] 11. The apparatus of claim 10 wherein the processor further identifies those regions on the part in which light reflected from the part is so diffuse or so specular that data obtained for those regions cannot be used in part acceptability determination.

[c12] 12. The apparatus of claim 11 in which the processor masks those regions of the part for which the data cannot be used, the position of the part and the light intensity level now being varied by the respective moving means and light source to obtain new data for those regions which is useful for determining part acceptability, the processor replacing the data for those regions which cannot be used with the new data whereby the acceptability of the part can now be determined.

[c13] 13. The apparatus of claim 10 in which the moving means moves the part to different positions and the intensity of the light level of the light source is also varied so to locate a part position and light intensity level which produces the smallest range in variation of the data over the surface of the part.

[c14] 14. The apparatus of claim 13 wherein the light source is a laser stripe projector and a plurality of cameras view the illuminated part.